

## § 1065.630

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[73 FR 37324, June 30, 2008, as amended at 73 FR 59330, Oct. 8, 2008; 75 FR 23045, Apr. 30, 2010; 76 FR 57453, Sept. 15, 2011]

### § 1065.630 1980 international gravity formula.

The acceleration of Earth's gravity,  $a_g$ , varies depending on your location. Calculate  $a_g$  at your latitude, as follows:

$$\begin{aligned} a_g = & 9.7803267715 \cdot [1 + s \\ & 5.2790414 \cdot 10^{-3} \cdot \sin^2(\theta) + \\ & 2.32718 \cdot 10^{-5} \cdot \sin^4(\theta) + \\ & 1.262 \cdot 10^{-7} \cdot \sin^6(\theta) + \\ & 7 \cdot 10^{-10} \cdot \sin^8(\theta)] \quad \text{Eq. 1065.630-1} \end{aligned}$$

Where:

$\theta$  = Degrees north or south latitude.

Example:

$\theta = 45^\circ$

$$\begin{aligned} a_g = & 9.7803267715 \cdot (1 + \\ & 5.2790414 \cdot 10^{-3} \cdot \sin^2(45) + \\ & 2.32718 \cdot 10^{-5} \cdot \sin^4(45) + \\ & 1.262 \cdot 10^{-7} \cdot \sin^6(45) + \\ & 7 \cdot 10^{-10} \cdot \sin^8(45)) \\ a_g = & 9.8178291229 \text{ m/s}^2 \end{aligned}$$

## 40 CFR Ch. I (7–1–12 Edition)

### § 1065.640 Flow meter calibration calculations.

This section describes the calculations for calibrating various flow meters. After you calibrate a flow meter using these calculations, use the calculations described in § 1065.642 to calculate flow during an emission test. Paragraph (a) of this section first describes how to convert reference flow meter outputs for use in the calibration equations, which are presented on a molar basis. The remaining paragraphs describe the calibration calculations that are specific to certain types of flow meters.

(a) *Reference meter conversions.* The calibration equations in this section use molar flow rate,  $\dot{n}_{\text{ref}}$ , as a reference quantity. If your reference meter outputs a flow rate in a different quantity, such as standard volume rate,  $\dot{V}_{\text{stdref}}$ , actual volume rate,  $\dot{V}_{\text{actref}}$ , or mass rate,  $\dot{m}_{\text{ref}}$ , convert your reference meter output to a molar flow rate using the following equations, noting that while values for volume rate, mass rate, pressure, temperature, and molar mass may change during an emission test, you should ensure that they are as constant as practical for each individual set point during a flow meter calibration:

$$\dot{n}_{\text{ref}} = \frac{\dot{V}_{\text{stdref}} \cdot P_{\text{std}}}{T_{\text{std}} \cdot R} = \frac{\dot{V}_{\text{actref}} \cdot P_{\text{act}}}{T_{\text{act}} \cdot R} = \frac{\dot{m}_{\text{ref}}}{M_{\text{mix}}}$$

Eq. 1065.640–1

Where:

$\dot{n}_{\text{ref}}$  = reference molar flow rate.

$\dot{V}_{\text{stdref}}$  = reference volume flow rate, corrected to a standard pressure and a standard temperature.

$\dot{V}_{\text{actref}}$  = reference volume flow rate at the actual pressure and temperature of the flow rate.

$\dot{m}_{\text{ref}}$  = reference mass flow.

$P_{\text{std}}$  = standard pressure.

$P_{\text{act}}$  = actual pressure of the flow rate.

$T_{\text{std}}$  = standard temperature.

$T_{\text{act}}$  = actual temperature of the flow rate.

$R$  = molar gas constant.

$M_{\text{mix}}$  = molar mass of the flow rate.

Example 1:

$\dot{V}_{\text{stdref}} = 1000.00 \text{ ft}^3/\text{min} = 0.471948 \text{ m}^3/\text{s}$

$P = 29.9213 \text{ in Hg @ } 32^\circ\text{F} = 101325 \text{ Pa}$

$T = 68.0^\circ\text{F} = 293.15 \text{ K}$

$R = 8.314472 \text{ J}/(\text{mol} \cdot \text{K})$

$$\dot{n}_{\text{ref}} = \frac{0.471948 \cdot 101325}{293.15 \cdot 8.314472}$$